Shanmuga Industries Arts & Science College T.V.Malai

NOVEMBER/DECEMBER 2024

GEPH24C/DEPH24C — NON-LINEAR OPTICS

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Write any two characteristics of a laser.
2. Name two gas lasers.
3. What are uniaxial crystals?
4. Define bistability.
5. Explain photorefractive effect.
6. What is an optical amplifier?
7. Name two inorganic non linear optical materials.
8. Name two organic non linear optical materials.
9. List factors that determine fiber bandwidth.
10. Write an expression for the attenuation inside an optical fibre.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Explain how population inversion is achieved in a He-Ne with the help of an energy level.

Or

(b) Write a short note on Ti-Sapphire laser.

12. (a) Discuss sum and difference frequency generation.

Or

(b) Write a short note on terahertz radiation.

13. (a) Explain Foucault.

Or

(b) Write a short note on two photon absorption.

14. (a) Write a short note on semi-organic non linear optical materials.

Or

(b) List the criteria for selecting useful non liner optical materials.

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15. (a) Write a short note on fiber losses.

Or

(b) Explain wave propagation inside a fiber. Hence derive an expression for numerical aperture.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Explain the construction and working of ruby laser with the help of diagrams.

17. Discuss polarisation response of materials to light and hence explain second and third harmonic generation.

18. Explain parametric generation and optical parametric amplification. List some of their applications.

19. Discuss the various mechanisms that determine laser induced surface damage threshold.

20. Classify optical fibers based on (a) refractive index profile (b) modes. Explain them in detail with the help of diagrams.

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